Alternative Methods for Determining LCRs

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NYSRC – Installed Capacity Subcommittee

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Agenda

- **Phase 2: Refining the Methodology**
  - Aligning Cost and Requirements Final Results and Proposal
  - Transmission Security
- **Reliability Metrics**
- **Next Steps**
  - Phase 3: Market Simulations
  - BIC Vote
  - 2018 Project Scope
- **Questions**

Phase 2: Refining the Methodology

Phase 2: Refining Methodology

- **Align the cost assumptions and the optimized requirements**
  - Final results and proposed methodology
- **Transmission Security**
  - Preliminary methodology and result

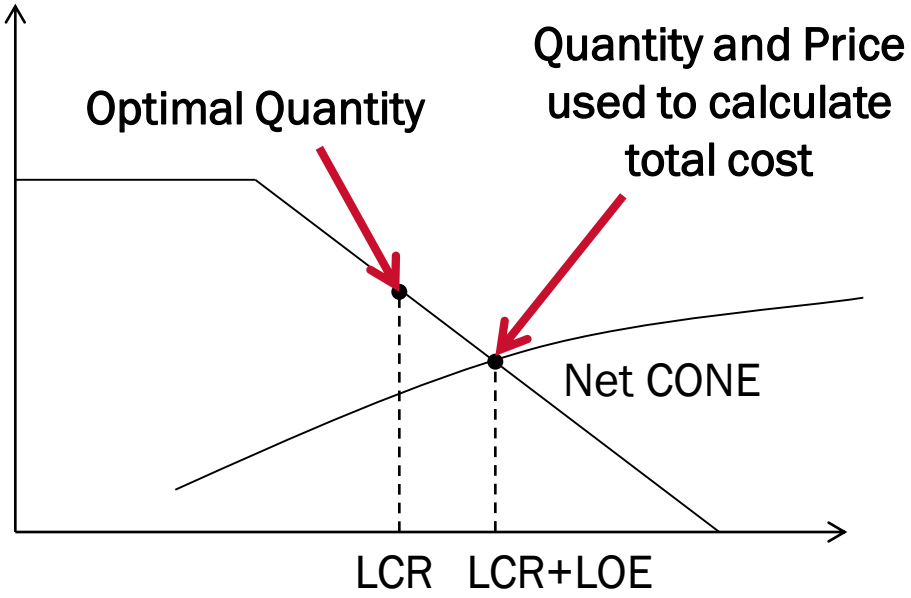
Aligning Cost and Requirements Results

Methods for Aligning

- **Alter Objective Function**
  - Alters the quantities in the objective function, but not the decision variables (*i.e.*, LCRs)
- **Alter Cost Curve**
  - Alters the prices in the objective function
- **Alter the Optimal Requirements**
  - Alters the decision variables to be the optimal quantity of capacity at the level of excess ("LOE") condition

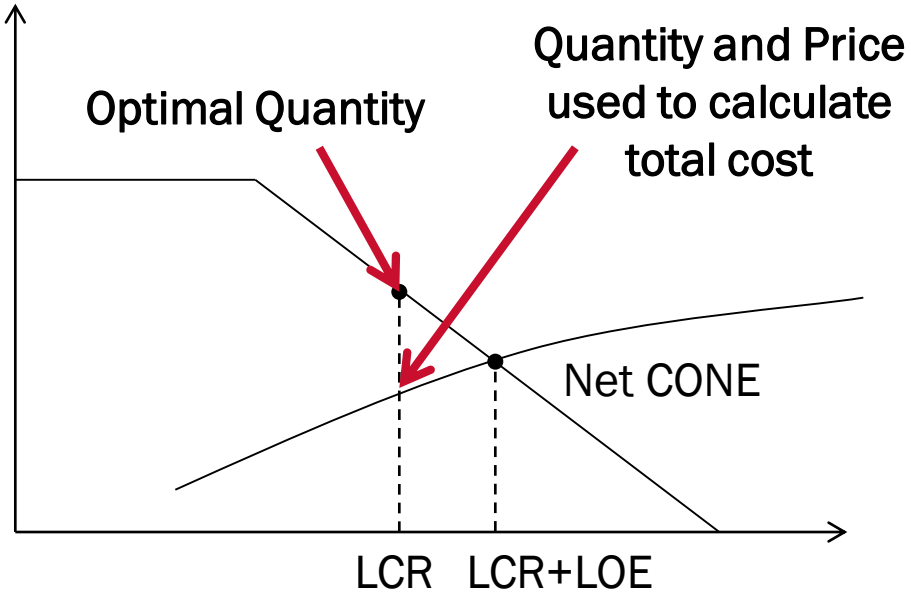
Altered Objective Function Methodology

- Alters the objective function to minimize cost of procuring capacity at the LOE condition
- Decision variable remains LCRs
- Minimized cost at LOE



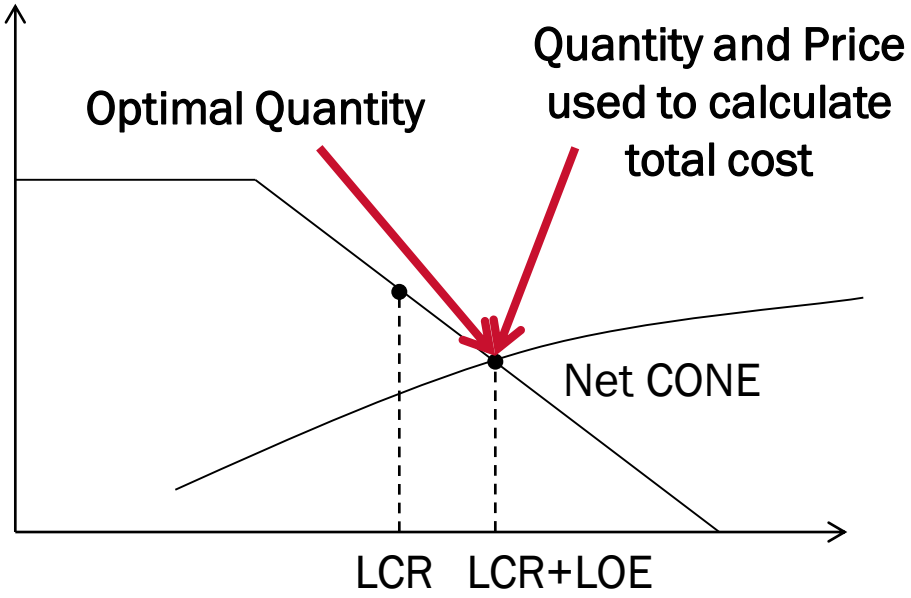
Altering Cost Curve Results

- Used Net CONE curves that were evaluated at 100% of the requirement rather than the Level of Excess
- Decision variable remains LCRs
- Minimizes cost at the LCRs rather than the LOE



Altering the Optimal Requirements

- Optimize the quantity of capacity needed at the LOE condition subject the LOLE constraint at the LOE
- LCRs calculated by removing the capacity at the LOE
- Final LCRs result in LOLE of 0.099 days/year



Aligning Cost and Requirements Results

Scenario	Zone J LCR	Zone K LCR	G-J LCR
Current LCR Methodology	81.4%	103.2%	91.3%
Optimized Methodology	77.5%	107.0%	91.0%
Refined Optimized Methodology (Altered Objective function)	78.0%	105.3%	91.5%
Refined Optimized Methodology (Aligned Cost Curve)	78.2%	105.6%	90.9%
Refined Optimized Methodology (Optimal capacity at LOE condition)	78.9%	105.3%	91.5%

Aligning Cost and Requirements Results

Scenario	Zone J LCR	Zone K LCR	G-J LCR
Current LCR Methodology	9,495 MW	5,603 MW	14,664 MW
Optimized Methodology	9,044 MW	5,807 MW	14,616 MW
Refined Optimized Methodology (Altered Objective function)	9,102 MW	5,715 MW	14,696 MW
Refined Optimized Methodology (Aligned Cost Curve)	9,126 MW	5,731 MW	14,600 MW
Refined Optimized Methodology (Optimal capacity at LOE condition)	9,208 MW	5,715 MW	14,696 MW

Methodology Proposal

Aligning Cost and Requirements Methodology Proposal

- Based upon the analysis conducted, the NYISO proposes that the "Alter Objective Function" methodology be used
- This methodology optimizes the LCRs to minimize the cost of capacity assuming the quantity and price at the LOE condition

Reasons for Proposal

- This methodology achieves the objective of aligning the cost and requirements while avoiding suboptimal outcomes identified with the other methodologies
- Alter Cost curve
  - Utilization of cost that is not market based
- Alter the Optimal Requirement
  - Potential for the LOLE at the LOE to change based on the base case
  - When the base case is changed, risk of not meeting LOLE or achieving greater than LOLE is introduced due to need to remove the capacity associated with the LOE from the optimized quantity of capacity

Final Base Case

- The proposed refinement will be used in the final methodology and final base case

Scenario	Zone J LCR	Zone K LCR	G-J LCR
Current LCR Methodology	81.4%	103.2%	91.3%
Preliminary Optimized Base Case	77.5%	107.0%	91.0%
Final Optimized Base Case (Altered Objective function)	78.0%	105.3%	91.5%

Final Base Case

Scenario	Zone J LCR	Zone K LCR	G-J LCR
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Transmission Security

Transmission Security Methodology

- N-1-1 analysis was conducted to determine the transmission security import limits into each Locality
- These import limits were used to determine the minimum UCAP required for each Locality
- This minimum UCAP requirement was then converted into ICAP using the 5-year zonal EFORd utilized in the MARS model

Example Calculation

Transmission Security Requirements	Formula	Zone X
Load Forecast (MW)	[A] = Given	12,000
Transmission Security Import Limit (MW)	[B] = Given	1,500
Transmission Security UCAP Requirement (MW)	[C] = [A]-[B]	10,500
Transmission Security UCAP Requirement (%)	[D] = [C]/[A]	87.5%
5 Year EFORd (%)	[E] = Given	8.0%
Transmission Security ICAP Requirement (MW)	[F] = [D]/(1-[E])	11,413
Transmission Security LCR Floor (%)	[G] = [F]/[A]	**95.1%**

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Preliminary Transmission Security LCR Floor

Transmission Security Requirements	G-J	Zone J	Zone K
Load Forecast (MW)	16,061	11,670	5,427
Transmission Security Import Limit (MW)	3,250	3,250	400
Transmission Security UCAP Requirement (MW)	12,811	8,420	5,027
Transmission Security UCAP Requirement (%)	79.76%	72.15%	92.63%
5 Year EFORd (%)	10.50%	9.99%	10.06%
Transmission Security ICAP Requirement (MW)	14,314	9,355	5,589
Transmission Security LCR Floor (%)	**89.12%**	**80.16%**	**102.99%**

*Values are preliminary and subject to change

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Preliminary Transmission Security LCR Floors

	Zone J LCR	G-J LCR	Zone K LCR
Preliminary Transmission Security LCR Floors	80.16%	89.12%	102.99%

- These values are preliminary and subject to change
- These preliminary floors will be incorporated into the optimization and presented at a future ICAPWG and ICS meeting
- Final base case will be presented both with and without transmission security limits for information purposes
  - The final base case incorporating these limits will be presented at a future ICAPWG and ICS meeting

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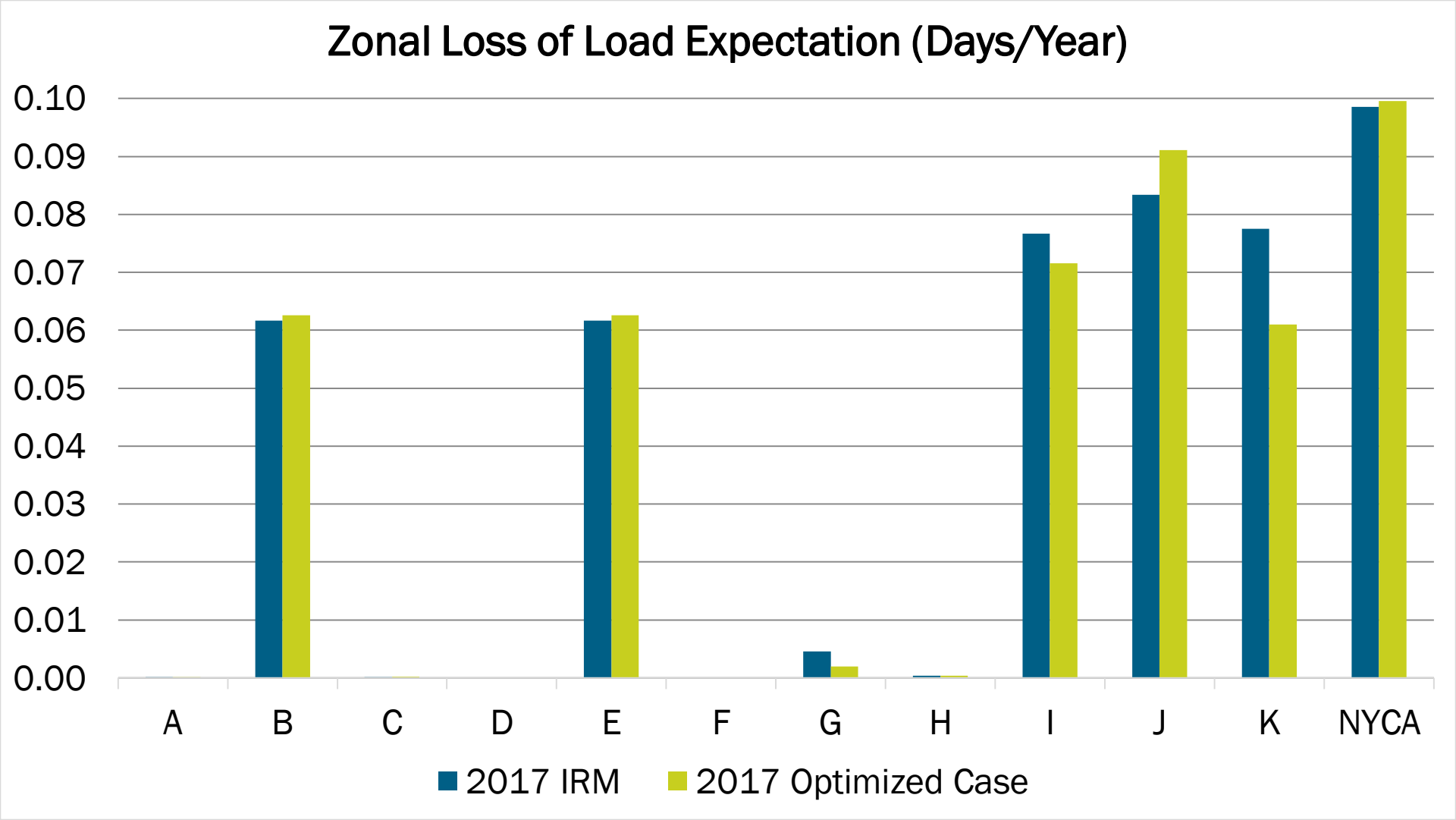
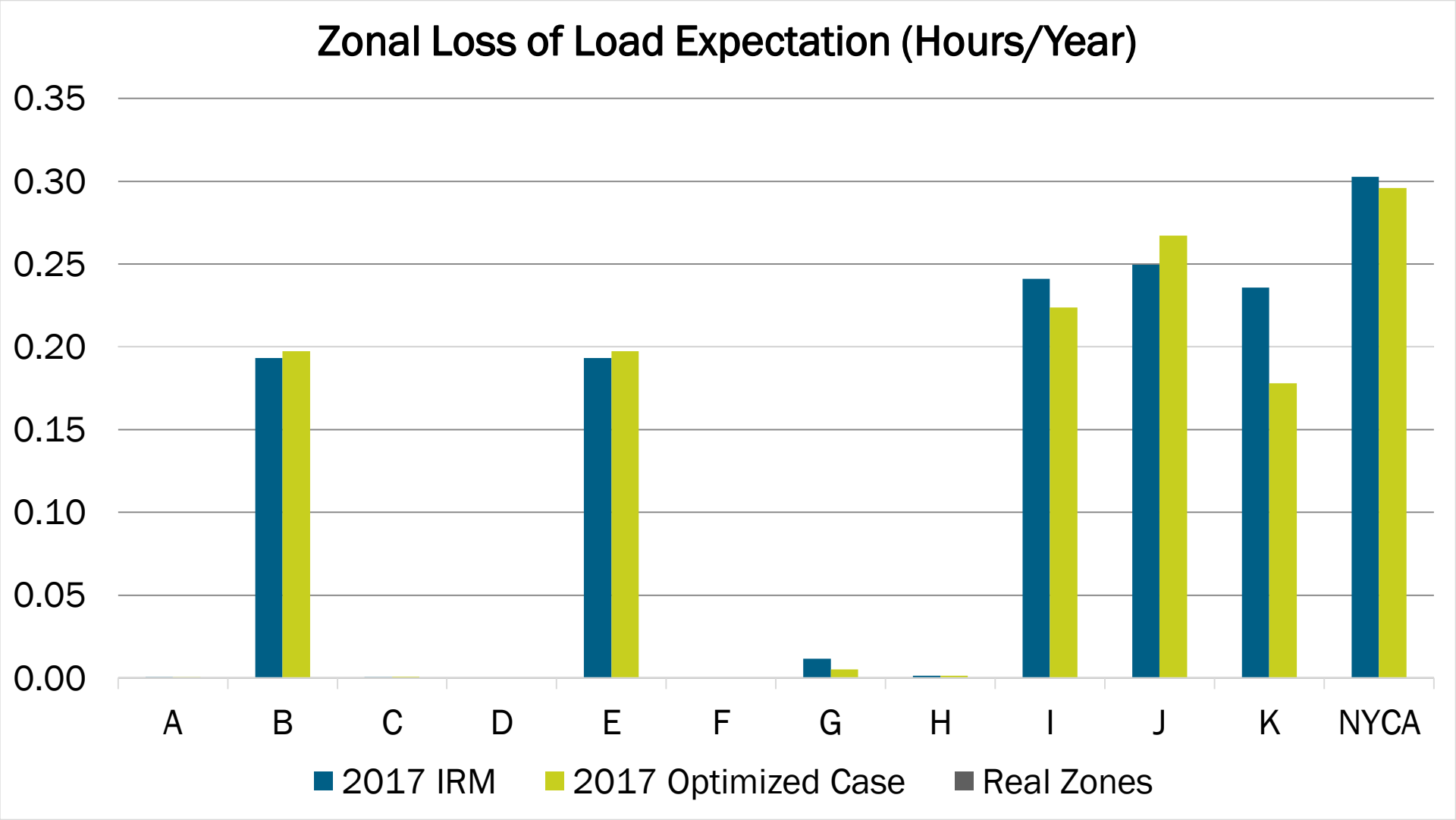
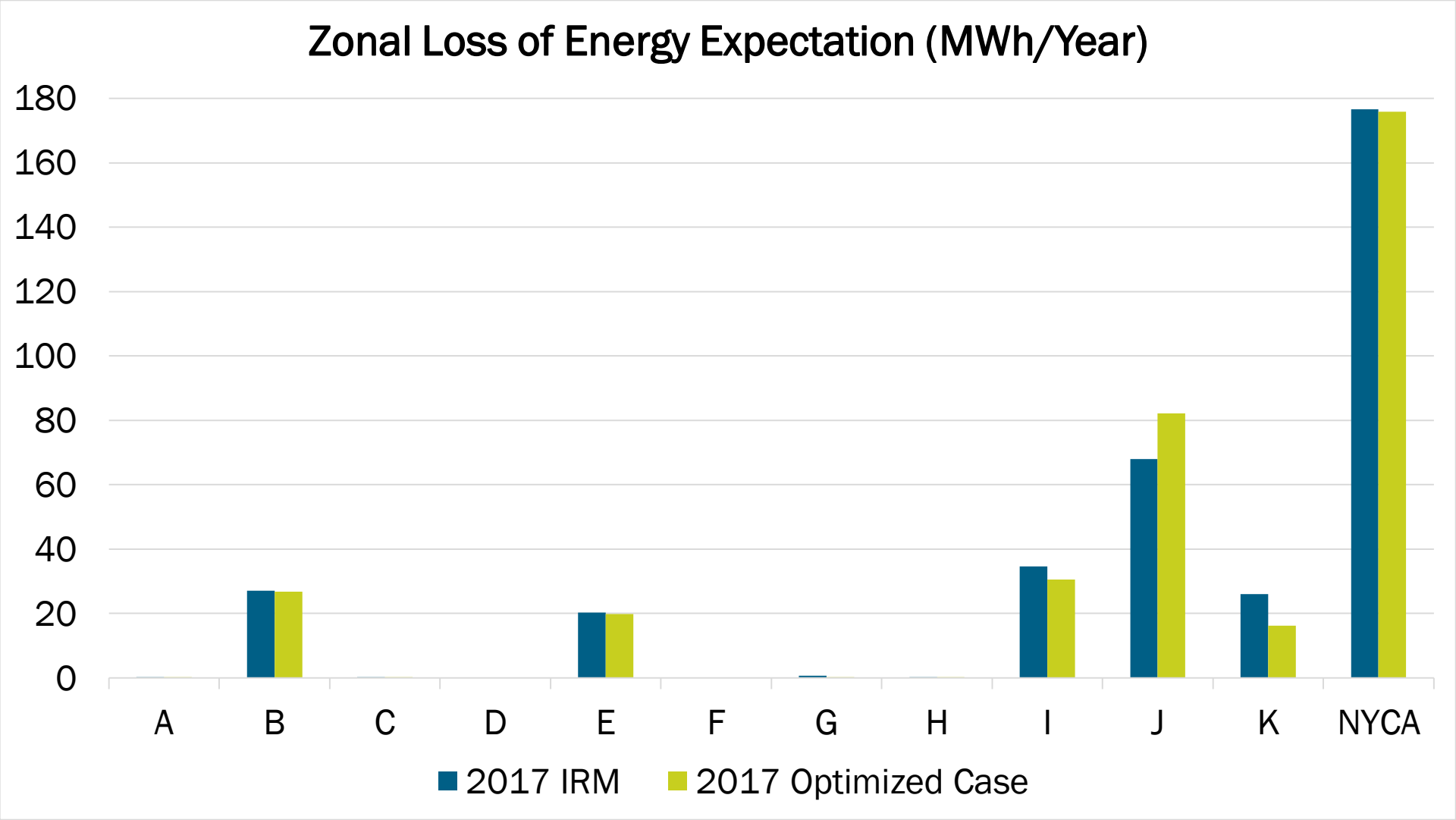
Reliability Analysis

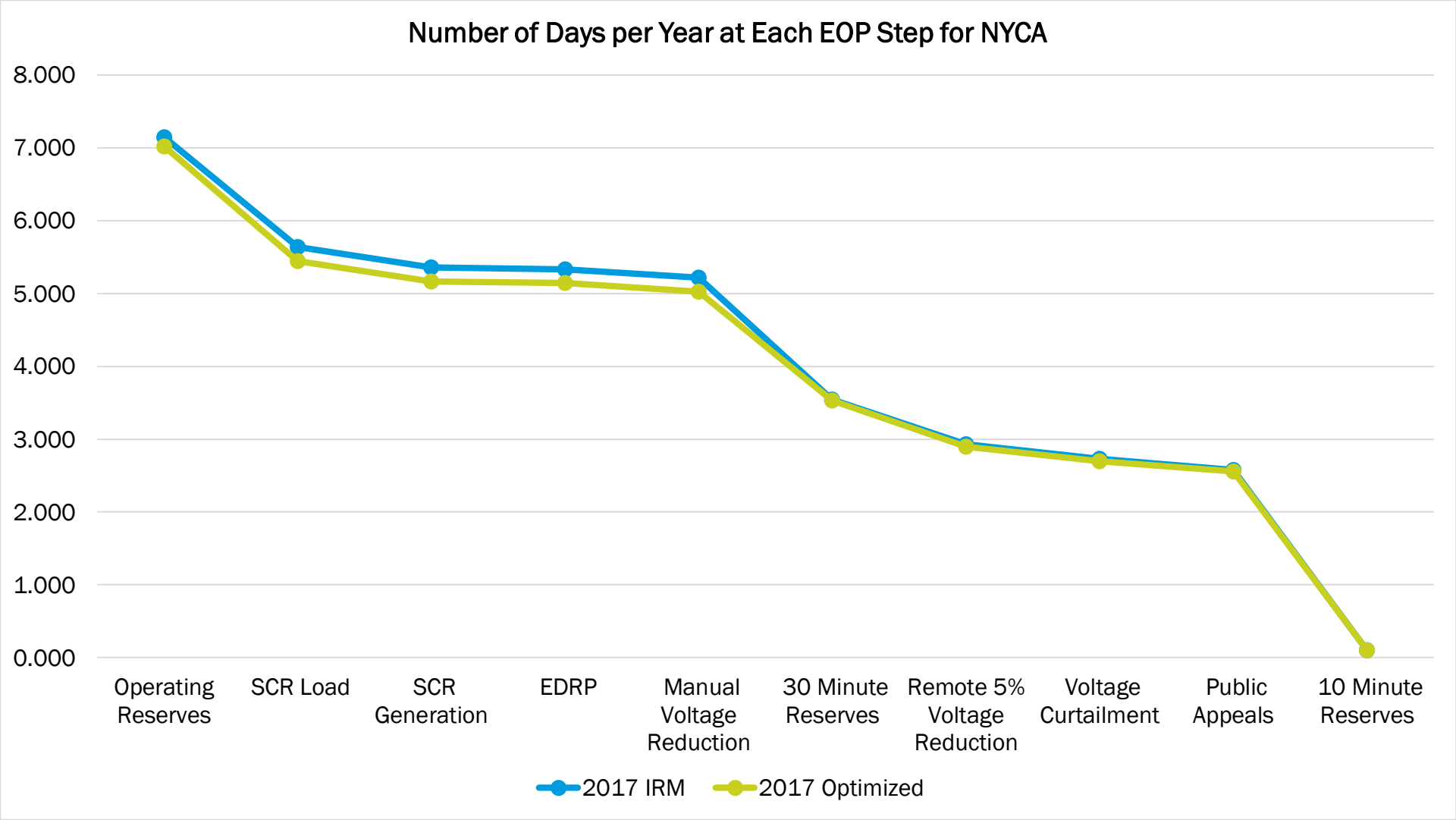
Reliability Metrics

- NYSRC – ICS requested that the NYISO provide the LOLE and loss of energy expectation results at the zonal level for the optimized preliminary base case
- It was also requested that the NYISO indicate the frequency of EOP steps in the preliminary optimization base case
- That information is on the following slides


Zonal Loss of Load Expectation (Days/Year)
0.10
0.09
0.08
0.07
0.06
0.05
0.04
0.03
0.02
0.01
0.00
A
B
C
D
E
F
G
H
I
J
K
NYCA
2017 IRM
2017 Optimized Case


Zonal Loss of Load Expectation (Hours/Year)
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
A
B
C
D
E
F
G
H
I
J
K
NYCA
2017 IRM
2017 Optimized Case
Real Zones


Zonal Loss of Energy Expectation (MWh/Year)
180
160
140
120
100
80
60
40
20
0
A
B
C
D
E
F
G
H
I
J
K
NYCA
2017 IRM
2017 Optimized Case


Number of Days per Year at Each EOP Step for NYCA
8.000
7.000
6.000
5.000
4.000
3.000
2.000
1.000
0.000
Operating Reserves
SCR Load
SCR Generation
EDRP
Manual Voltage Reduction
30 Minute Reserves
Remote 5% Voltage Reduction
Voltage Curtailment
Public Appeals
10 Minute Reserves
2017 IRM
2017 Optimized

Next Steps

Stage 3: Market Simulations

- **Goal:** Simulate additional market scenarios to demonstrate performance of final methodology
  - Perform sensitivities with multiple changes to the system
  - Evaluate how the process would be performed with full Tan45 followed by optimization

BIC Vote

- **Bring complete market design to BIC for vote by end of 2017**
  - Milestone confirming stakeholder support with the market design and methodology as it has developed in the 2017 project
  - The vote will be used by the NYISO to efficiently allocate resources
    - Tariff development will be undertaken only if proposal has broad stakeholder support
    - Will determine if the 2018 Alternative Methods for LCRs will continue as currently defined

2018 Project Scope

- Review existing Tariff language and Draft Tariff language to reflect new methodology as necessary
  - Take to BIC and MC for action
- File revised Tariff language with FERC
- Revise LCR methodology documentation and any manual revisions required
- Develop internal process for implementation
- Address any administrative issues (ongoing)

Other Next Steps

- The NYISO will consider input received during today's ICS meeting
- Additional comments sent to deckels@nyiso.com will be considered
- The NYISO will return to a future ICS meeting to discuss its progress and adjustments to the plan after considering comments and results

2017 Project Development

Stage	Objective	Specific Topics:
Proof of Concept	Demonstrate alternative methodology in relation to guiding principles (*i.e.*, least cost, stability, robust, predictability)	Generation +/- Unit net CONE +/- Transmission +/-
Refine Methodology	Modify the alternative method to ensure that all aspects have a purpose and are being performed as a result of sound market and engineering principles	Unit net CONE curves Potential Bounds Modeling methodology
Market Simulations	Simulate realistic market situations to demonstrate performance of methodology	Changes in resources Topological changes Locality configurations
Defining Process	Develop a process for the methodology that ensures guiding principles are being achieved over time	Develop process of method Process timeline Transition methods
Demonstrating Market Benefits	Demonstrate the methodology results in market benefits and resolve any issues that arise from its implementation	Consumer impact Multiyear simulation Cost allocation
Final Market Design	Summarize all findings and develop a final market design for implementation	Develop final market design

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Questions?

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- Maintaining and enhancing regional reliability
- Operating open, fair and competitive wholesale electricity markets
- Planning the power system for the future
- Providing factual information to policy makers, stakeholders and investors in the power system

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